

**GANPAT UNIVERSITY**  
**B.TECH SEM.7<sup>th</sup> ELECTRICAL ENGINEERING**  
**REGULAR EXAMINATION NOV-DEC 2015**  
**2EE722 SPECIAL ELECTRICAL MACHINES**

TIME: 3 HOURS

TOTAL MARKS-70

INSTRUCTION:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

## Section-I

Que-1

- (a) Describe the constructions of PMDC motor. (06)
- (b) Obtain the transfer function of an armature-controlled DC servo motor. Give its block diagram. (06)

OR

Que-1

- (a) Draw and explain the phasor diagram of Permanent magnet synchronous motor. (04)
- (b) Sketch and explain the torque speed characteristics of armature-controlled separately excited and series DC servo motors. (04)
- (c) Define following terms: (04)
  - (i) Remanence
  - (ii) Coercivity
  - (iii) Cogging torque
  - (iv) Permeance co-efficient (PC)

Que-2

- (a) Obtain the torque equation of Permanent magnet synchronous motor. (06)
- (b) A permanent magnet DC motor has an armature resistance of  $1.03 \Omega$ . It draws a current of  $1.25 \text{ A}$  at no load with  $50 \text{ V}$  supply and running at  $2100 \text{ rpm}$ . Find (a) speed voltage constant (b) rotational losses (c) output power when it runs at  $1700 \text{ rpm}$  at  $48 \text{ V}$  supply. (05)

OR

Que-2

- (a) Derive torque and emf equation of PMDC motor with equivalent circuit. (06)
- (b) A three-phase, four-pole star connected synchronous motor has 72 slots with 20 conductors per slots. The flux/pole is  $0.05 \text{ Wb}$  and speed is  $1500 \text{ rpm}$ . Assuming the full-pitched coil, find the line and phase voltage. (05)

Que-3

- Attempt any three.** (12)
- (a) Why Permanent Magnet Synchronous Motor is not self starting?
  - (b) Describe the construction of DC servo motor.
  - (c) Comparison between conventional synchronous motor and PMSM.
  - (d) Sketch and explain the performance characteristics of a PMDC motor.

**Section-II**

- Que-4 (a) Describe the construction of AC servo motors of different types. (06)  
(b) Discuss the various types of rotor construction used in Permanent Magnet Synchronous Motor. (06)

OR

- Que-4 (a) Describe the construction and working principle of hybrid stepping motor. (06)  
(b) Describe the hysteresis type and PWM type current regulator for one phase of a SRM. (06)

- Que-5 (a) With Block diagram explain micro processor base control of stepper motor (06)  
(b) Why do we require a position sensor for operation of SRM? (05)

OR

- Que-5 (a) Write Short note on Hall Effect Sensor used for SRM. (05)  
(b) Explain open loop and closed loop control of stepper motor. (06)

- Que-6 **Attempt any three.** (12)  
(a) Why and where standard motors should be replaced by energy efficient motors?  
(b) Which are the conditions for successful operation of SRM?  
(c) Explain the dynamic characteristics of stepper motor.  
(d) Where are the possibilities to improve the efficiency of induction motor?

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